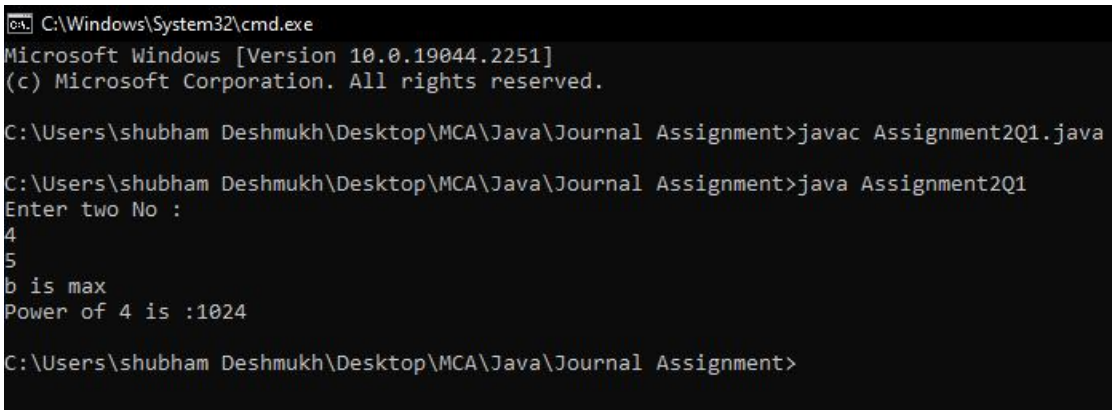
1).Create a package Mathematics with two classes Maximum and Power. Write a java program to accept two numbers from user and perform the following operations on it: a. Find Maximum of two numbers. b. Calculate the power (X, Y);

```
import mathematics.*;
import java.util.*;
public class Assignment2Q1 {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter two No :" );
      int a=sc.nextInt();
      int b= sc.nextInt();

      Maximum m = new Maximum(a,b);
      m.display();

      Power p = new Power(a,b);
      p.disp();
      sc.close();
   }
}
```

```
package mathematics;

public class Maximum {

 int a, b;

 public Maximum(int a, int b) {
  this.a = a;
  this.b = b;
 }

 public void display() {
  if (a > b) {
   System.out.println("a is max");
  } else {
   System.out.println("b is max");
  }
 }
}
```

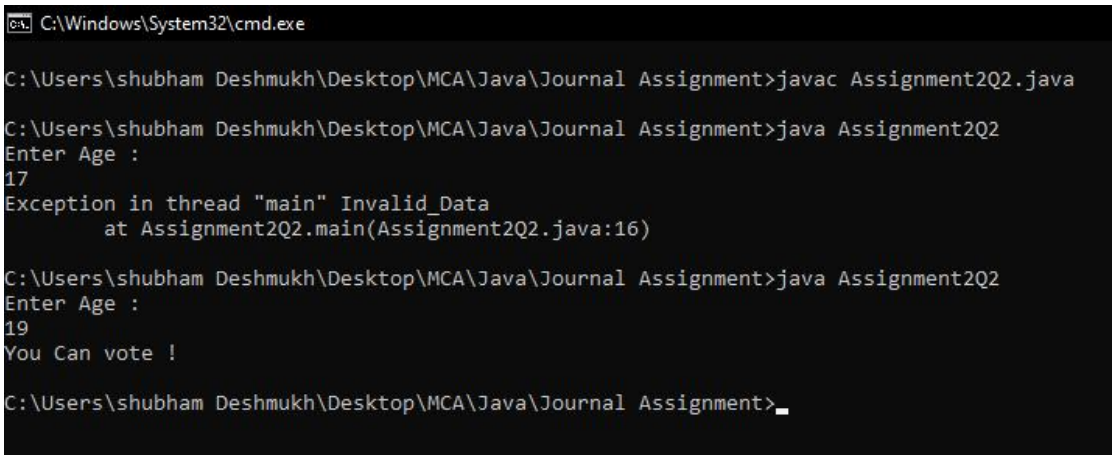
```
package mathematics;

public class Power {

 int N, P;
```

```
  public Power(int a, int b) {
    N = a;
    P = b;
  }

  public void disp() {
    int pow = 1;
    for (int i = 1; i <= P; i++) {
      pow = pow * N;
    }
    System.out.println("Power of " + N + " is :" + pow);
  }
}
```



2).Write a program that generates a custom exception if age entered for voting in election is less than 18 years

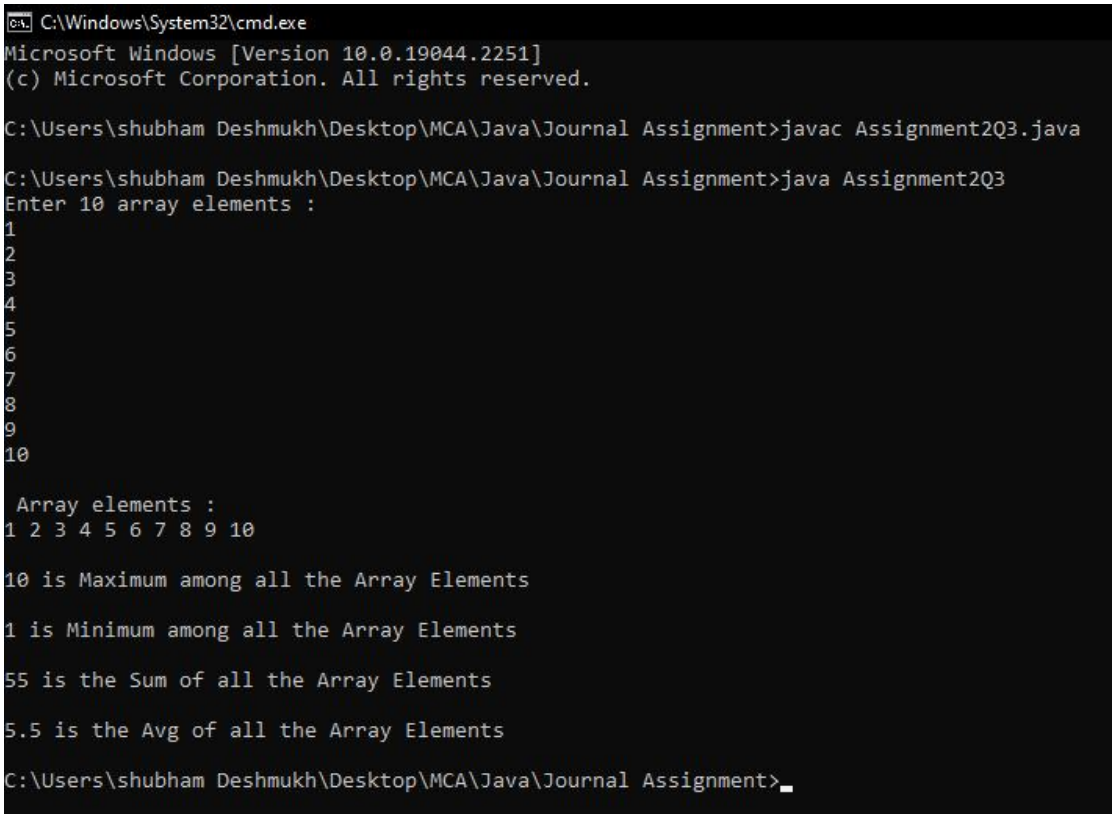
```
import java.util.Scanner;

class Invalid_Data extends Exception {}

public class Assignment2Q2 {

  public static void main(String[] args) throws Invalid_Data {
    Scanner sc = new Scanner(System.in);
    System.out.println("Enter Age : ");
    int age = sc.nextInt();

    if (age < 18) {
      throw new Invalid_Data();
    } else {
      System.out.println("You Can vote !");
    }
  }
}
```



3) .Write a program to accept 10 elements of an array from user and find:
a. Greatest element
b. Smallest element
c. Sum of elements
d. Average of elements of array

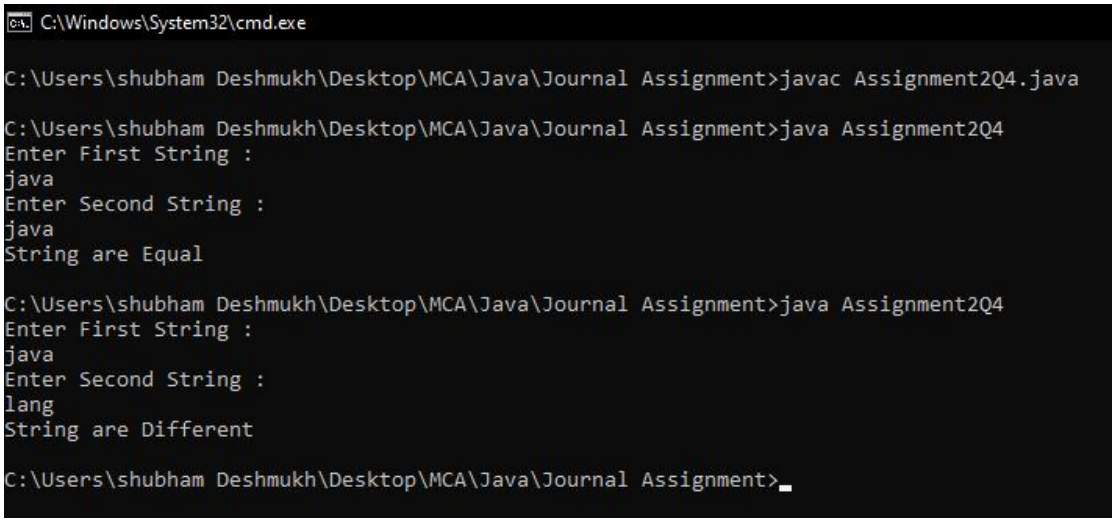
```
import java.util.*;
public class Assignment2Q3 {

  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int[] arr = new int[10];
    System.out.println("Enter 10 array elements : ");
    for (int i = 0; i < arr.length; i++) {
      arr[i] = sc.nextInt();
    }
    System.out.println("\n Array elements : ");
    for (int i = 0; i < arr.length; i++) {
      System.out.print(arr[i] + " ");
    }
    System.out.print("\n");

    int max = arr[0];
    for (int i = 0; i < 10; i++) {
      if (arr[i] > max) {
        max = arr[i];
      }
    }
    System.out.println(
      "\n" + max + " is Maximum among all the Array Elements "
    );

    int min = arr[0];
    for (int i = 0; i < 10; i++) {
      if (arr[i] < min) {
        min = arr[i];
      }
    }
    System.out.println(
      "\n" + min + " is Minimum among all the Array Elements "
    );

    int sum = 0;
    for (int i = 0; i < 10; i++) {
      sum = sum + arr[i];
    }
    System.out.println("\n" + sum + " is the Sum of all the Array Elements ");

    float avg = (float)sum / 10;
```

```
    System.out.println("\n" + avg + " is the Avg of all the Array Elements ");
    sc.close();
  }
}
```



4).Write a program to accept two string from user and check both strings are equal or not.

```
import java.util.*;
public class Assignment2Q4 {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      System.out.println("Enter First String : ");
      String str1 = sc.next();
      System.out.println("Enter Second String : ");
      String str2 = sc.next();

      if(str1.equals(str2)){
         System.out.println("String are Equal ");
      }
      else{
         System.out.println("String are Different ");
      }
      sc.close();
   }
}
```



5).Write a package for Games in Java, which have two classes Indoor and Outdoor. Use a function display () to generate the list of players for the specific games. (Use Parameterized constructor, finalize() method and Array Of Objects)

```
import java.util.Scanner;
import mathematics.*;
public class Assignment2Q5{

  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);

    int ch;
    do {
      System.out.println("\n1.Indoor \n2.Outdoor\n\nEnter Your Choice : ");
      ch = sc.nextInt();

      switch (ch) {
        case 1:
          System.out.println("Enter how many players : ");
          int n = sc.nextInt();

          Indoor[] in = new Indoor[n];

          System.out.println("\nEnter " + n + " Indoor Player Name : ");
          for (int i = 0; i < in.length; i++) {
            String p_name = sc.next();
            in[i] = new Indoor(p_name);
          }
          System.out.println("\nIndoor Games : ");
          for (int j = 0; j < in.length; j++) {
            in[j].display();
          }
          break;
        case 2:
          System.out.println("Enter how many players : ");
          int n1 = sc.nextInt();
          Outdoor[] out = new Outdoor[n1];

          System.out.println("\nEnter " + n1 + " Outdoor Player Name : ");
          for (int i = 0; i < out.length; i++) {
            String p_name = sc.next();
            out[i] = new Outdoor(p_name);
          }
          System.out.println("\nOutdoor Games : ");
          for (int j = 0; j < out.length; j++) {
            out[j].display();
          }
```

```
        default:
          break;
      }
    } while (ch < 3);

    sc.close();
  }
}

package mathematics;

public class Indoor {

  String player;

  public Indoor(String player) {
    this.player = player;
  }
  public void display() {
    System.out.println(player);
  }
  protected void finalize() {
    System.out.println("Finalize is called");
  }
}


package mathematics;

public class Outdoor {
    String player;

    public Outdoor(String player) {
      this.player = player;
    }
    public void display() {
      System.out.println(player);
    }
    public void finalize() {
      System.out.println("Finalize is called");
    }
}
```

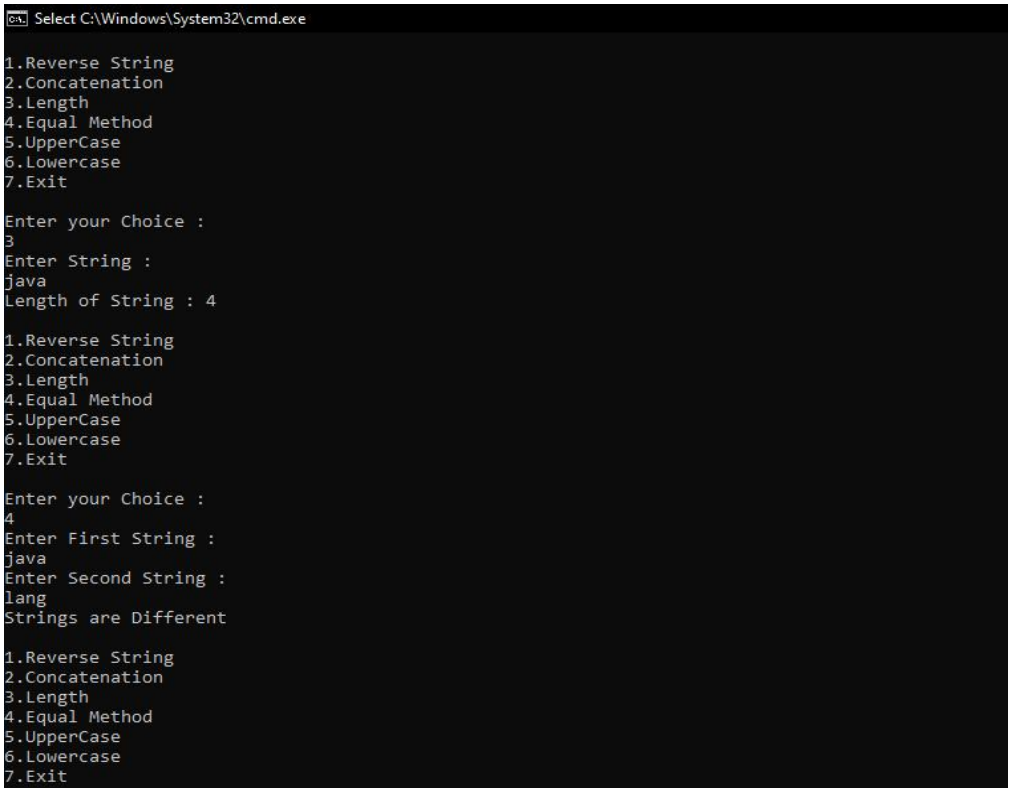
```
C:\Windows\System32\cmd.exe

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>javac Assignment2Q5.java

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>java Assignment2Q5

1.Indoor
2.Outdoor

Enter Your Choice :
1
Enter how many players :
2

Enter 2 Indoor Player Name :
Manan
Aman

Indoor Games :
Manan
Aman

1.Indoor
2.Outdoor

Enter Your Choice :
2
Enter how many players :
2

Enter 2 Outdoor Player Name :
Sham
Ram

Outdoor Games :
Sham
Ram

1.Indoor
2.Outdoor

Enter Your Choice :
3

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>
```

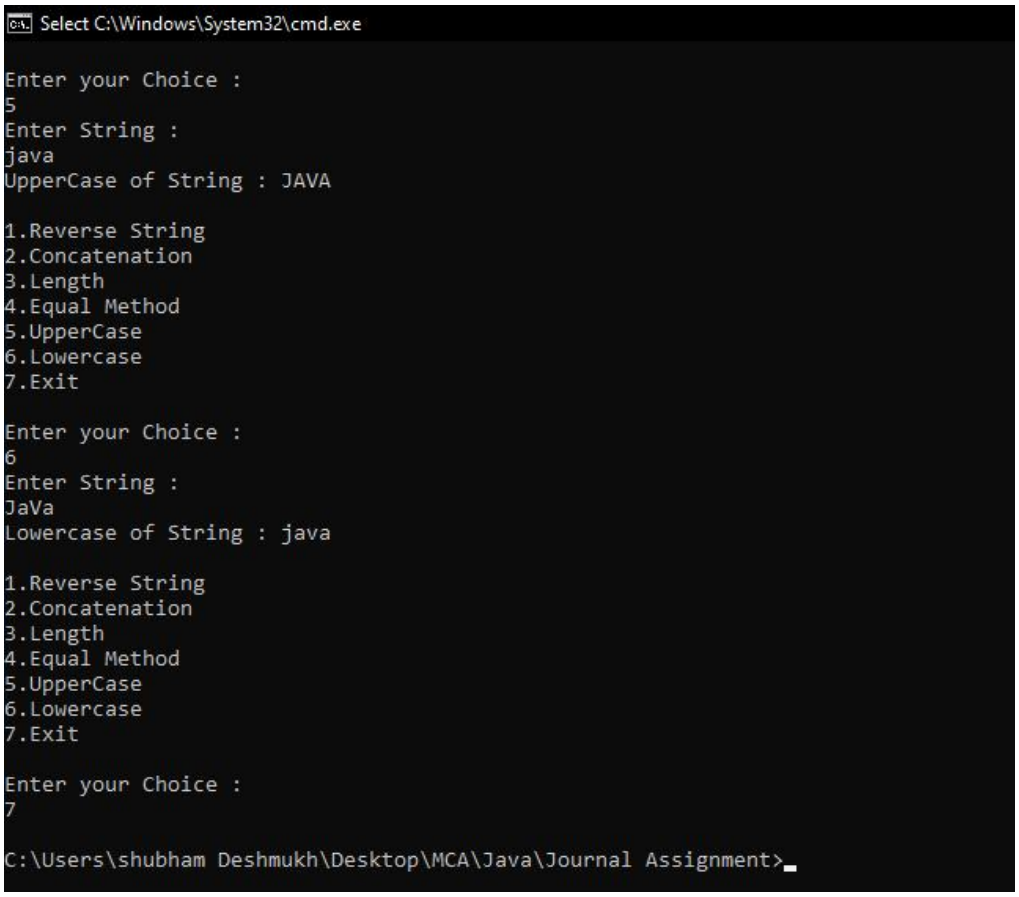
7).Write a Menu driven program for the following string operations
a) To find reverse string
b) Concatenate Two Strings.
c) Find the Length of the String.
d) to Use Equals Method In a String Class
e) To convert given string in Uppercase.
f) To convert given string in lowercase.

```
import java.util.Scanner;

public class Assignment2Q7 {

  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int ch;
    do {
      System.out.println(
        "\n1.Reverse String \n2.Concatenation \n3.Length \n4.Equal Method
\n5.UpperCase\n6.Lowercase\n7.Exit"
      );
      System.out.println("Enter your Choice :");
      ch = sc.nextInt();
      switch (ch) {
        case 1:
          String nstr = " ";

          System.out.println("Enter String : ");
          String str = sc.next();
          for (int i = 0; i < str.length(); i++) {
            char c = str.charAt(i);
            nstr = c + nstr;
          }
          System.out.println("Reversed String : " + nstr);
          break;
        case 2:
          System.out.println("Enter First String : ");
          String str1 = sc.next();
          System.out.println("Enter Second String : ");
          String str2 = sc.next();
          System.out.println("Concatenated String : " + str1.concat(str2));
          break;
        case 3:
          System.out.println("Enter String : ");
          String str4 = sc.next();
          System.out.println("Length of String : " + str4.length());
          break;
        case 4:
          System.out.println("Enter First String : ");
          String str5 = sc.next();
          System.out.println("Enter Second String : ");
```

```
        String str6 = sc.next();
        if (str5.equals(str6)) {
          System.out.println("Strings are Equal");
        } else {
          System.out.println("Strings are Different");
        }
        break;
      case 5:
        System.out.println("Enter String : ");
        String str7 = sc.next();
        System.out.println("UpperCase of String : " + str7.toUpperCase());
        break;
      case 6:
        System.out.println("Enter String : ");
        String str8 = sc.next();
        System.out.println("Lowercase of String : " + str8.toLowerCase());
        break;
      default:
        break;
    }
   } while (ch < 7);
   sc.close();
  }
}
```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2251]
(c) Microsoft Corporation. All rights reserved.

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>javac Assignment2Q7.java

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>java Assignment2Q7

1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit

Enter your Choice :
1
Enter String :
java
Reversed String : avaj

1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit

Enter your Choice :
2
Enter First String :
java
Enter Second String :
lang
Concatenated String : javalang
```


Select C:\Windows\System32\cmd.exe
1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit
Enter your Choice :
3
Enter String :
java
Length of String : 4
1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit
Enter your Choice :
4
Enter First String :
java
Enter Second String :
lang
Strings are Different
1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit


Select C:\Windows\System32\cmd.exe
Enter your Choice :
5
Enter String :
java
UpperCase of String : JAVA
1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit
Enter your Choice :
6
Enter String :
JaVa
Lowercase of String : java
1.Reverse String
2.Concatenation
3.Length
4.Equal Method
5.UpperCase
6.Lowercase
7.Exit
Enter your Choice :
7
C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>

8.Write a program to create a graph and perform the following operations: a)Add Vertex b)Add edge c)Display

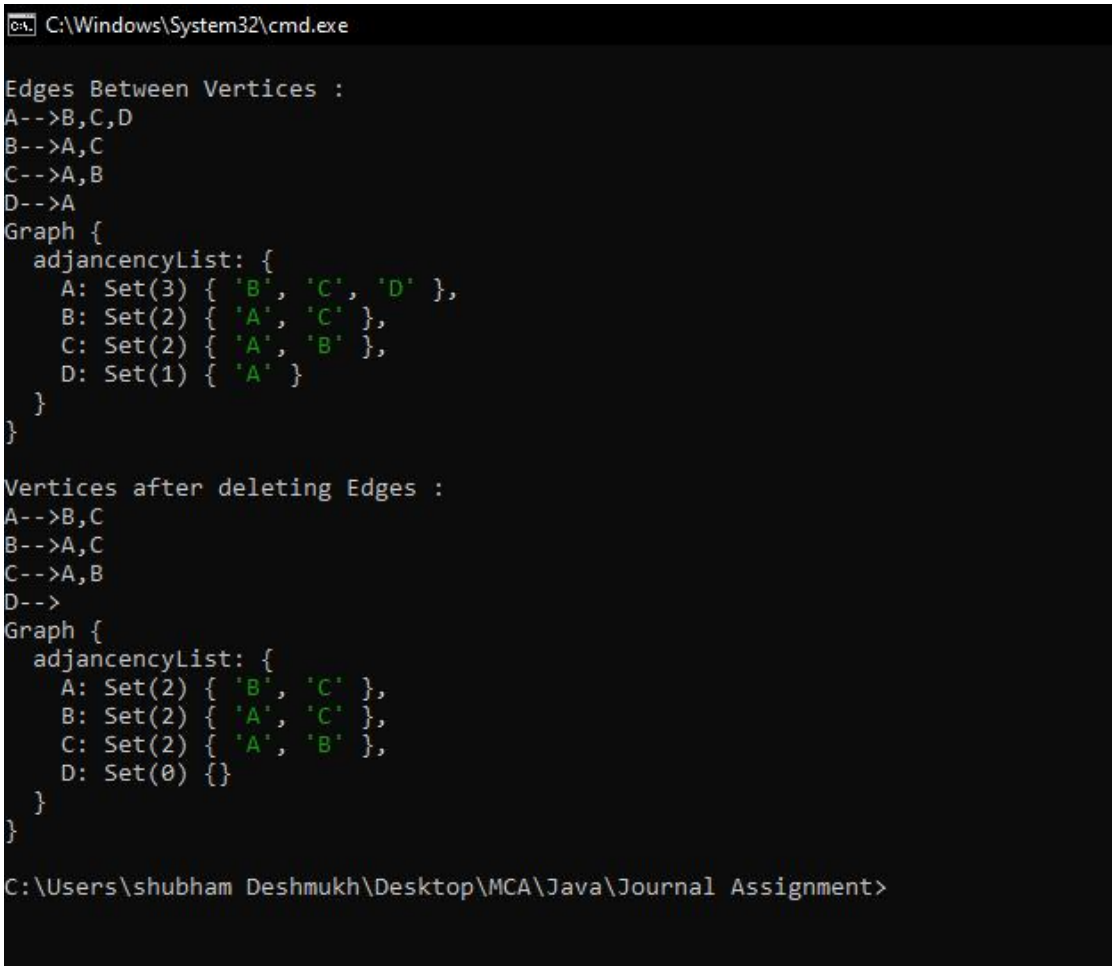
```
class Graph {
   constructor() {
      this.adjancylist = {};
   }
   addVertex(vertex) {
      if (!this.adjancylist[vertex]) {
         this.adjancylist[vertex] = new Set();
      }
   }
   addEdge(vertex1, vertex2) {
      if (!this.adjancylist[vertex1]) {
         this.addVertex(vertex1);
      }
      if (!this.adjancylist[vertex2]) {
         this.addVertex(vertex2);
      }
      this.adjancylist[vertex1].add(vertex2);
      this.adjancylist[vertex2].add(vertex1);
   }
   display() {
      for (let vertex in this.adjancylist) {
         console.log(vertex + "->" + [... this.adjancylist[vertex]]);
      }
   }
}
const g = new Graph();
g.addVertex(10);
g.addVertex(20);
g.addVertex(30);
g.addVertex(40);

g.addEdge(10, 20);
g.addEdge(30, 40);
g.display();

console.log(g)
```

```
C:\Windows\System32\cmd.exe

C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>node Assignment2Q8.js
10->20
20->10
30->40
40->30
Graph {
  adjancylist: {
    '10': Set(1) { 20 },
    '20': Set(1) { 10 },
    '30': Set(1) { 40 },
    '40': Set(1) { 30 }
  }
}
```

9).Write a program to create a graph and perform the following operations: a)Delete vertex b)Delete edge

```
class Graph {
   constructor() {
      this.adjancencyList = {};
   }
   addVertex(vertex) {
      if (!this.adjancencyList[vertex]) {
         this.adjancencyList[vertex] = new Set();
      }
   }

   addEdge(vertex1, vertex2) {
      if (!this.adjancencyList[vertex1]) {
         this.addVertex(vertex1);
      }

      if (!this.adjancencyList[vertex2]) {
         this.addVertex(vertex2);
      }
      this.adjancencyList[vertex1].add(vertex2);
      this.adjancencyList[vertex2].add(vertex1);
   }

   removeEdge(vertex1, vertex2) {
      this.adjancencyList[vertex1].delete(vertex2);
      this.adjancencyList[vertex2].delete(vertex1);
   }

   display() {
      for (let vert in this.adjancencyList) {
         console.log(vert + "-->" + [...this.adjancencyList[vert]]);
      }
   }
}
const g = new Graph();

g.addVertex('A');
g.addVertex('B');
g.addVertex('C');
g.addVertex('D');

g.addEdge('A', 'B');
g.addEdge('C', 'A');
g.addEdge('B', 'C');
g.addEdge('C', 'B');
g.addEdge('D', 'A');
g.addEdge('C', 'A');
```

```
console.log("\nEdges Between Vertices : ");
g.display();

g.removeEdge('A','B');
g.removeEdge('D','A');

console.log("\nVertices after deleting Edges : ");
g.display();
```



10).Write a program to create a graph and perform DFS

```
class Graph {
   constructor(v) {
      this.V = v;
      this.adj = new Array(v);
      for (let i = 0; i < v; i++) {
         this.adj[i] = [];
      }
   }
   addEdge(v, w) {
      this.adj[v].push(w);
   }
   DFSUtil(v, visited) {
      visited[v] = true;
      console.log(v + " ");
      for (let i of this.adj[v].values()) {
         let n = i;
         if (!visited[n]) this.DFSUtil(n, visited);
      }
   }
   DFS(v) {
      let visited = new Array(this.V);
      for (let i = 0; i < this.V; i++) {
         visited[i] = false;
      }

      this.DFSUtil(v, visited);
   }
}
g = new Graph(4);
g.addEdge(0, 1);
g.addEdge(0, 2);
g.addEdge(1, 2);
g.addEdge(2, 0);
g.addEdge(2, 3);
g.addEdge(3, 3);
console.log(
   "Following is Depth First Traversal " + "(starting from vertex 1)<br>"
);
g.DFS(1)
```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2251]
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C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>node Assignment2Q10.js
Following is Depth First Traversal (starting from vertex 1)<br>
1
2
0
3
```
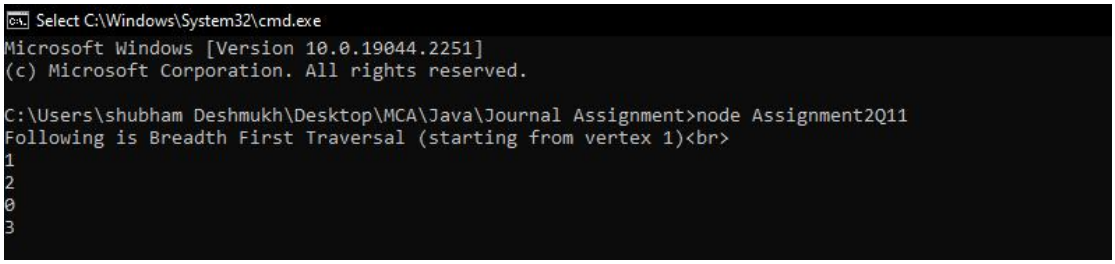

11).Write a program to create a graph and perform DFS

```
class Graph {
   constructor(v) {
      this.V = v;
      this.adj = new Array(v);
      for (let i = 0; i < v; i++) this.adj[i] = [];
   }
   addEdge(v, w) {
      this.adj[v].push(w);
   }
   BFS(s) {

      let visited = new Array(this.V);
      for (let i = 0; i < this.V; i++) {
         visited[i] = false;
      }

      let queue = [];

      visited[s] = true;
      queue.push(s);
      while (queue.length > 0) {

         s = queue[0];
         console.log(s + " ");
         queue.shift();

         this.adj[s].forEach((adjacent, i) => {
            if (!visited[adjacent]) {
               visited[adjacent] = true;
               queue.push(adjacent);
            }
         });
      }
   }
}
g = new Graph(4);
g.addEdge(0, 1);
g.addEdge(0, 2);
g.addEdge(1, 2);
g.addEdge(2, 0);
g.addEdge(2, 3);
g.addEdge(3, 3);
console.log(
   "Following is Breadth First Traversal " + "(starting from vertex 1)<br>"
);
g.BFS(1)
```


Select C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2251]
(c) Microsoft Corporation. All rights reserved.
C:\Users\shubham Deshmukh\Desktop\MCA\Java\Journal Assignment>node Assignment2Q11
Following is Breadth First Traversal (starting from vertex 1)
1
2
0
3